

CLINICO-RADIOLOGICAL STUDY OF PERIARTHRITIS SHOULDER

THESIS

For

**MASTER OF SURGERY
(ORTHOPAEDICS)**



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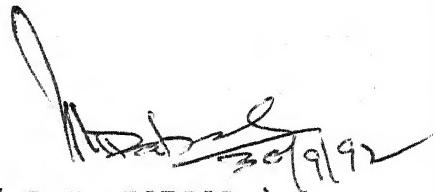
C E R T I F I C A T E

This is to certify that the work entitled "CLINICO-RADIOLOGICAL STUDY OF PERIARTHRITIS SHOULDER", which is being submitted as a thesis for M.S. (Orthopaedic Surgery) was carried out by DR. ANIL KUMAR AGARWAL, under my constant supervision and guidance.

The techniques embodied in this work were undertaken by the candidate himself. The results and observations were checked and verified by me periodically.

He has put in the necessary stay in the Department of Orthopaedics according to the University regulations.

Dated : 30 SEP 1992


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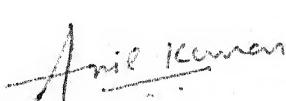
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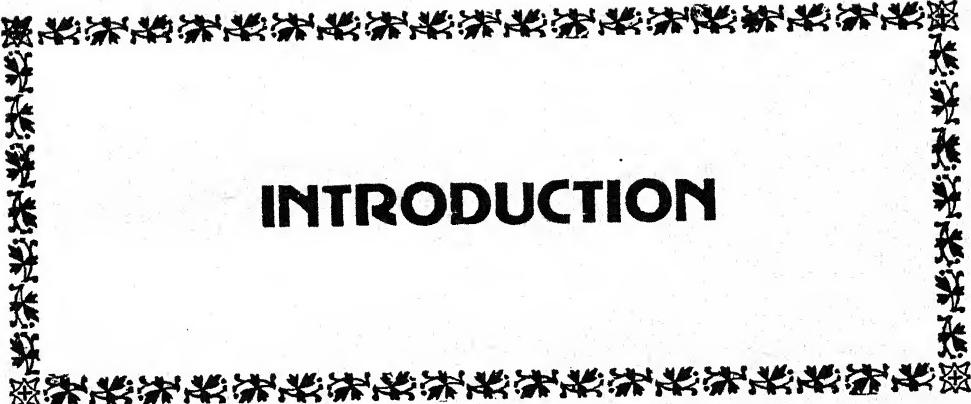
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INTRODUCTION

INTRODUCTION

The outstanding feature of modern man has been the versatile mobility and functions of his evolved hand, and its work in close co-operation with the elbow and the shoulder. If the movements at the shoulder joint are hampered, the performance of different functions of upper limb is substantially compromised. May it be the daily pursuits of life or benediction of a priest, or the performance of an oriental dancer, shoulder mobility has an important part to play and without it they are difficult to perform.

The word 'shoulder' in English language is used with various meanings. The classical being 'to support' and when we think of this, we are reminded of Atlas supporting the whole world on his shoulder. To the surgeon, it means part of intricate mechanism of the shoulder girdle, which serve the purpose of moving the arm on the trunk and it is an important tool for his daily work.

It is likely that painful stiff shoulder has bothered humankind since its beginning. In the Charak

Samhita there is reference to the pain and stiffness of joint as 'vata'. There is reference about the disease of joints in the work of Hippocrates too.

One of the conditions which commonly affects the mobility of shoulder joint of individuals is labelled as 'periarthritis of shoulder', also called 'Frozen shoulder', or Adhesive 'capsulitis', due to variable amount of restricted shoulder mobility, as a result of capsular adhesion.

Despite such ancient history of the disease, it still presents as a complex problem till today, a mystery unsolved. The cost to the patient and the society, in the form of, lost work, compensation, treatment and psychological aspects is to be closely viewed. There is evidence that many patients with periarthritis shoulder do not respond to medical therapy.

Periarthritis shoulder presents a clinical syndrome that is more or less constant. It is well recognised by pain in the shoulder region with or without radiation down the arm in a patient of 50-60 years with gradual limitation of movements and occasionally superadded with weakness of the arm and commonly associated anxiety or depression.

The movements are limited in all directions from the position in which the limb is rested, and more so

of abduction and external rotation. Limitation of movements in early stages is mainly due to spasm, which later leads on to adhesion.

The actual cause of this disease is not definitely known.

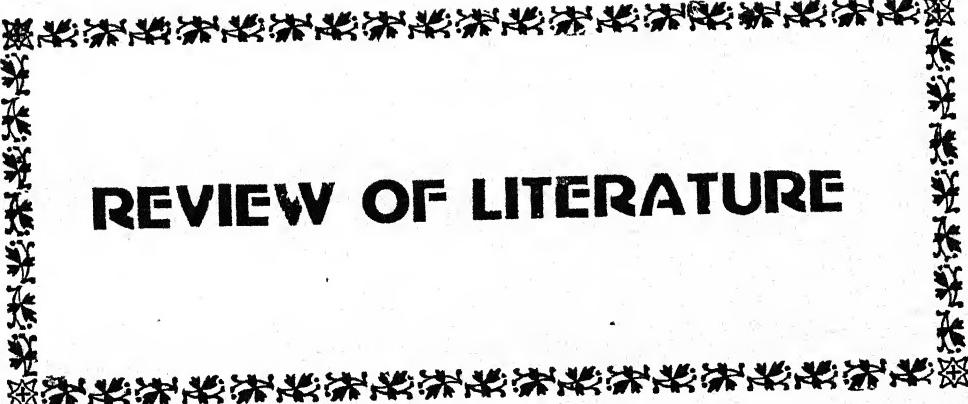
And just as in any branch of medicine, there are encountered patients malingering, hysterical, over anxious, depressive, whose symptoms and signs do not align for any conclusive thought. Then, it is always essential to doubly check before dismissing a patient as suffering from psychological problem.

Radiological investigation in periarthritis shoulder give little clue to its diagnosis, showing in majority of cases only some amount of osteoporosis and in some cases slight diminution of joint space as calcified deposits.

Despite the problem being centuries old, effective therapy of periarthritis shoulder still remains elusive. The treatment rendered should be such that it makes the mobility of shoulder joint comfortable i.e. without pain and the increases in the range of movement towards normalcy. Presently the treatment is broadly categorized into conservative forms, and the surgical interventions. In majority the conservative route of management is helpful. Conservative methods include rest to limb

analgesics, sedation, application of heat, exercises and hydrocortisone. Physiotherapy will be in the form of pendular movements, wheel exercises, circumduction, abduction exercises by way of wall crepping at the shoulder. Physiotherapy proves of paramount significance in the restoring the movement of shoulder joint. With the advent of cortisone, a new era has dawned in modern medicine. De Palma (1963) successfully treated periarthritis shoulder with intra-articular hydrocortisone. So the aim of present study are :

1. Study of clinical behaviour of periarthritis shoulder.
2. Comparative evaluation of various methods of conservative treatment of periarthritis shoulder.



REVIEW OF LITERATURE

REVIEW OF LITERATURE

Systemic knowledge of medicine evolved with the writings of Hippocrates (460-375 B.C.). His volume on articulations is said to contain some of the most detailed description about the diseases of the joints. In Charaka Samhita, they have called the pain and stiffness of a joint as "vata".

Sir Benjamin Brodie (1818) was the first man to initiate a systemic study of shoulder lesion. His work was continued by J. Smith, an English anatomist and he noted the defects in the supraspinatus insertions of the shoulder examined in cadavers.

Duplay (1872) was the first investigator to recognise the extra-articular tissues as the possible factor responsible for "Painful and Stiff" shoulder and it was he, who applied the term 'Periarthritis' shoulder for such lesion. He thought it to be caused by involvement of scapulohumeral joint and subacromial bursa. Sixty years later Pasteur (1933) described the same clinical picture and called it "tenobursitis". Duplay recognised pain as the outstanding symptom of this disease in majority of cases. Pain which is of a dull aching

character, almost like a tooth ache is mostly felt, (i) in the deep humeral head, (ii) at the insertion of deltoid and along the deltoid muscle. He recommended manipulative therapy for these conditions.

Baer and Painter (1907) recognised calcified deposits with the help of X-Rays and this group of cases were separated from the large heterogenous group.

Codman (1934) introduced the term 'Frozen shoulder' for the first time. 'Frozen shoulder' refers to complete abolition of movements at the glenohumeral joint, although upper limb can still move on the trunk with the help of thoracoscapular mechanism. In such cases arm can be elevated to about 65° from the side, but because of movements of scapula around the chest wall, it passes forward from the coronal plane by 20° - 30° as the lower angle passes laterally and forwards. He emphasized the importance of bursae around the shoulder and accused subarcomial bursitis for causing this affection. He said that 'Frozen shoulder' is to be more common in sedentary workers than in labourers (86%). This analysis pointed out the fact that disuse and inactivity play an important role in causation of this disease. He advised 'Pendulum' type of exercise as a preventive treatment in every patient with the aim to maintain motion in shoulder joint after slight trauma as sprain of shoulder. In 'Frozen shoulder' patients, he advocated wide abduction

of shoulder, restricting the movement to an arc above right angle. He rested the patient in bed and gradually into wide abduction. Once the greater tuberosity has slipped under the acromion, patient were immediately comfortable and began their glenohumeral movements in their highly abducted position.

Haggart and Allen (1935) said that the injury to the supraspinatus tendon varying from slight tear (rim rents) to complete rupture of tendon is the most common cause of shoulder disability and is the etiological factor. Careful review of the history of these patient plus histological study of the tendon necrosis indicate that the changes are most probably traumatic in origin. Trauma causing tendon necrosis and calcification, thus leading to subacromial bursitis, may be a major or minor one. The latter is well illustrated in occupation like typewriting and painting in which the individual hold the arm slightly abducted for relatively longer periods thus tending to pinch or irritate the tendon of short rotator muscle between the head of humerus and acromion process. He noticed extensive atrophy of shoulder musculature particularly evident in the deltoid and in the infra and supraspinatus muscles. He treated majority of cases by simple conservative methods as active exercises particularly ('Pendulum type') to re-develop shoulder muscle power combined with short periods of

intensive massage preceded by heat. Reassurance that the shoulder joint will function again is most important.

Lindblom, Knut and Palmer Ivan (1939) used the term "ruptures in the tendon of aponeurosis of shoulder joint instead of rupture in supraspinatus tendon". The treatment was operative as repair of rupture aponeurosis. Immediately after operation the arm was fixed in a plaster and abducted to about 60°. Four weeks later patient performed passive movements in horizontal plane with the arm still in abduction.

Bosworth, B.M. (1941) observed that calcium deposits in tendinous cuff which form the capsule of shoulder joint recognised as a potent source of shoulder pain. Calcium deposits occur most commonly during period of greatest activity of adult life, and especially among male. Occupation that requires constant prolonged abduction of the arms, faster the formation of calcium deposits in the shoulder. Excision of the deposits is recommended as the best treatment.

Kraus, H. (1941) described a method of treatment for impaired function when pain is the factor responsible for the loss of motion or power. The treatment was in the form of application of surface anaesthetic combined with active motion.

Travell et.al, (1942) recognised that many instances of 'painful shoulder syndrome' present tender areas in muscles around the shoulder (periarthritis). Tender areas in muscle may cause pain not only locally but also referred to other somatic strictures. He observed that the right shoulder was involved more (51%) than left (40%) of the 76 affected shoulders. He also noted that about one third of patients had both shoulders involved. No relation of occupation to the shoulder pain was observed. Travell treated 58 cases by intramuscular infiltration with procaine hydrochloride. Full restoration of motion and complete remission of pain were secured by this technique in 62% of patients. 31% showed improvement. Complete relief of pain and disability was obtained in 91% of those whose symptoms had been present for less than two months.

Lippman (1943) described adhesive tenosynovitis as the causative factor of Frozen shoulder, a concept with which many differ even today. Biceps tendinitis is the primary etiological factor in the production of periarthritis of shoulder (later this view is also supported by Hitehock and Bechtal, 1944). Lippman elicited tenderness along the biceps tendon in periarthritis shoulder (Lippman 90-100%; De Palma, 72%; Hitchcock and Bechtal, 98%, 1946). He reported a female predominance

(65%) and that the right shoulder is more commonly affected than the left (72%).

He observed that periarthritis causes limitation of abduction and rotation and is free in other movements. Other sign he described is tenderness in bicipital groove (90%). Tenderness is best elicited by applying pressure in the inter-tubercular sutures and rolling the biceps tendon under the thumb in the sulcus, a little above and medial to the deltoid tuberosity, where deltoid is inserted.

As the patient improves, this tenderness decreases.

Physiotherapy has been the sheet anchor in the treatment of periarthritis of shoulder, till the advent of hydrocortisone, and still it forms an essential and integral part of every other type of treatment. It breaks through the vicious circle of periarthritis, for it breaks the 'disuse' a factor which play a major role in periarthritis.

Howarth (1945) supported the role of manipulative stretching of the joint. Nelson (1959) and Charnley (1959) also accepted the role of manipulation of the joint under general anaesthesia.

Hitchcock and Bechtol (1948) who explored many cases of painful shoulders have reported varying degree of peritendinitis and attrition and damage to the biceps tendon and its partial or complete dislocation.

Limitation of adduction is the most important feature of this syndrome. Its limitation is almost pathognomonic of this disorder. It is seldom noticed by the patient. The simple test is to ask the patient to touch the opposite spine of scapula with the arm and forearm across the front of the chest.

Withers (1949) of Northern Ireland studied 41 cases of 'adhesive capsulitis', and treated them by manipulation under anaesthesia. After manipulation the limb was supported in abduction splint for two weeks and active exercises started from beginning. There was full recovery within a period ranging from two weeks to four months.

Stewart (1949) studied significance of radiographic changes in upper end of humerus as erosion of articular surface of the head of humerus, irregularity of cortical bone of greater tuberosity; in the painful shoulder.

Simmonds (1949) believed that 'Frozen shoulder' is characterised by a well known cycle of events -

1. There is increasingly severe pain in shoulder spreading down the arm, in a patient aged fifty to sixty years.
2. The pain persist and glenohumeral movement decreases.
3. The pain becomes less severe but stiffness persist.

4. The pain subsides or movement is slowly regained.

He submitted that 'Frozen shoulder' syndrome is caused by chronic inflammatory reaction in the supraspinatus tendon due to process of degeneration that occur constantly in this tendon with advancing age.

He advocated treatment as rest of limb in a sling, gently pendulum exercises and perhaps novocaine injection locally. He contra-indicated manipulation or exercises in erect position in the painful phase because they lead to further injury.

Lippman (1951) saying that the 'Frozen shoulder' is a non-infectious diffuse fibroplastic inflammatory process. He reported that the right shoulder is more commonly affected than the left (72%) suggesting a predisposition to the shoulder getting the hardest use. Cases have been reported as late as eighties and as early as late twenties and a female predominance has been reported (Lippman, 65%; Naviaser 62-59%). It is observed that periarthritis causes limitation of abduction and rotation and is free in other movements. He, talking the role of hydrocortisone in calcified deposits says that its use has proved to be of value as a stop gap. He mentioned that Physiotherapy has been the sheet anchor in the treatment of periarthritis shoulder.

Hollander, J.L., Brown, E.M. et.al (1951, 1953) injected locally hydrocortisone is much more effective in supressing synovial inflammation. In 69 patients with rheumatoid arthritis injection of hydrocortisone in one or more joint has resulted in prompt local alleviation of symptoms and sign. In patients with osteoarthritis he observed same result with use of hydrocortisone.

According to De Palma, A.F. (1952), 'Frozen shoulder' is a clinical entity which is produced by muscular inactivity of the shoulder in individual after 40 years of age. The greatest incidence is found between 50 and 60 years and women are more frequently affected than men (68.3% in women). It is relatively common disorder in patients afflicted with cardiovascular, pulmonary or metabolic disorders. Bicipital tenosynovitis is the most common etiologic factor. Early in disease pain and stiffness in the shoulder are the outstanding symptoms. Pain during the night is often severe and interferes with sleep. Once pain is eliminated, restoration of function can begin. Pressure over intertubercular sulcus and rolling bicep tendon, the thumb elicit tenderness.

The treatment of choice in early cases is complete bed rest, sedative to relieve pain, continuous hot fomentation to the shoulder region and active progressive exercises in the supine position. Within a

few days active pendulum, crawling-up the wall and pulley exercises are added.

Buck, J.E. (1953) in his study advocated manipulation under anaesthesia alongwith intra-articular injections of cortisone with a relatively short course of physiotherapy giving excellent results.

Coventry, M.B. (1953) states that periarthritis of the shoulder is a manifestation of pain, a stiffness in the shoulder of varying degree. Three forms can be recognised.

1. Pain with definite but minimal stiffness.
2. Pain with marked stiffness (Frozen shoulder).
3. The "shoulder-hand syndrome".

There are many causes for painful shoulder, but the occurrence of periarthritis is dependent on pain, disuse and presence of periarthritic personality. The treatment of periarthritis shoulder is directed toward reversal of the disuse syndrome. Any stimulus that can be given the patient to induce use of shoulder will result in recovery. Many factors or method are means of bringing about use of the extremity, as the will to recover, analgesic drugs (salicylates, codeine), physical medicine (exercises, massage, heat, cervical traction, roentgen therapy etc.) and cortisone.

Farkas, A. (1953) has laid great emphasis on two signs namely -

1. "The scapular sign",
2. "The elbow sign".

In the scapular sign, the patient tries to grasp the shoulder of the contra-lateral side with the arm across the chest, with the hand and fingers sliding over the shoulder, until the region of the spine of the scapula is reached. In periarthritis, patient fails in this attempt. In 'elbow sign', in which there is said to be inability to extend the elbow, when arm in about 30 degree dorsal extension. This inability to extend the elbow is due to flexion contracture, caused by long head of biceps.

Nearly 100 cases have been successfully treated with elevation of the foot of the bed, of hot, wet packs and of active exercises.

Crisp, E.J. and Kendall (1955) advocated intra-articular hydrocortisone injections in patients of periarthritis shoulder. The majority showed a dramatic response to hydrocortisone injection into various components of rotator cuff. In his technique he injected the hydrocortisone not only to the point of maximum tenderness, but to introduce into several points around

1. anteriorly into subacromial bursa,
2. antero-laterally into the region of the long head of biceps,
3. posteriorly into joint capsule.

The cases treated by this method 56% regained full function in four to six weeks; 22% were improved.

Nicholson and Wieder (1959) states that the term 'Frozen shoulder' while descriptive is not a scientific one, pericapsulitis and periarthritis are terms utilized for the same symptom complex. The subject complains of pain pronounced when lying down. The X-Ray study show a higher relationship of head of the humerus to the glenoid and there may be considerable bone atrophy. There may be swelling of hand, shininess of the skin, loss of normal concavity between the metacarpal heads on the dorsum of the hand. The pathology of 'Frozen shoulder' reveals an adherent capsule which is contracted, this tend to fix the shoulder.

In patients of periarthritis shoulder, he advocated treatment as bed rest with balanced traction and suspension is a better method than to attempt manipulation or open surgery, exercise can be more effective by utilizing a weight in the hand of involved side and gradually increasing the swing of the hand as a

pendulum, after eliminating gravity by forward flexion of trunk.

Johnson, J.T.H., Baltimore and Maryland (1959) mentioned the frequency of periarthritis shoulder (7.1%) with pulmonary tuberculosis. The patients with Frozen shoulders ranged in age from thirty seven to sixty eight years (average 50.8 yrs.). Men (67%) more affected than women (33%) and the right shoulder (53%) predominated than the left shoulder (47%).

Preventive treatment consisting in regular arm exercises for patients on bed, should be considered. But with the advent of antibiotics the principle of strict bed rest has been abandoned.

Kernwin et al (1961) characterized 'Frozen shoulder' by painful, restricted motion, altered scapulo-humeral rhythm, weakness, and at times, atrophy of local musculature, often without radiological abnormality. Pain is the first symptom to appear, gradually the discomfort increases.

Instillation of hydrocortisone with a local anaesthetic agent through lateral to the coracoid process obliquely upward and in medial direction. It should pass beneath the caraco-acromial arch. It is followed by complete relief.

Neviaser (1962), in his study based on cases of periarthritis explored by surgery and shoulders studied at autopsy. On incising the capsule in these cases, there will be conspicuous absence of synovial fluid and the redundant capsule instead of showing the normal separation from the humeral head will be adherent to it. He reported a female predominance. Most of the authors supported this view (Neviaser, 59%; Lippmann, 65%). History of trauma is present in nearly 4/3rd of cases (Neviaser - 21%; De Palma - 35%). He claim a peculiar personality behind periarthritis patient (Coventry, 1953 claimed the same). If the disease is prolonged, atrophy of the supraspinatus and infraspinatus and deltoid muscle can be noted (Lippman 1954; Bailey, 1962). It is observed by many that periarthritis causes limitation of abduction and rotation and is free in other movements. But Neviaser feel that this may be true in very early stages. But in a little later stages there will be limitation of movements in all planes. In the study of 53 cases of adhesive capsulitis where arthrogram were done, he reported definite decreased joint capacity with almost complete obliteration of the axillary fold.

Perhaps the most important treatment is the prophylactic treatment. Every effort should be made to maintain motion in the shoulder and if possible, the patient should be encouraged to do stooping exercises.

By instillation of cortisone intra-articular produces relief of pain and release of muscle spasm with resultant full shoulder motion.

Brown, J.T. (1962) in a series treated 127 patients by physiotherapy, manipulation and local hydrocortisone. The most satisfactory results were obtained by repeated local hydrocortisone and physiotherapy. In eight patients of shoulder hand syndrome a repeated stellate ganglion block gave rapid relief of symptoms.

Sinha et al (1962) quoted 1.5% to 2% incidence of periarthritis of shoulder of the total attendance. Study revealed that disease occurred in persons past 40 years and maximum incidence occurred in 50-54 years age group (38%). Average age is about 49.3 years (Neviaser, 1962 - 52.8 years). Periarthritis is more common in sedentary workers (96%) (Codman, 1930 - 86%; Neviaser, 1962 - 92%). This analysis points out the fact that disuse and inactivity play an important role in the causation of this disease.

The left shoulder is more commonly affected than the right. It is opposite to result obtained by Coventry and Lippmann. Ratio of females to males was 50 : 46.

Clinical signs exists as a clinical triad in most of the cases, namely -

- i) Pain at the limitation of the motion,
- ii) Limitation of motion,
- iii) Tenderness in the bicipital groove.

Pain at the limits of motion is present in almost all cases. As the limit of motion is reached, pain increases and the movement is no more possible. Limitation will be quite early mainly due to spasm and pains, which later lead on to adhesion and contractures. Range of active and passive movement is almost the same in all cases. This affection causes limitation of abduction and external rotation and is free for other movement in early stage but in later stage movement are limited in all direction. Limitation of adduction movement is almost pathognomonic of Frozen shoulder (Codman, 1930; Hitchcock, 1945). Tenderness of bicipital groove is present in most (92%) cases (Lippmann - 90%; De Palma - 72%). Other signs are wasting of the spinal muscle and deltoid muscle and psychic disturbances.

Treatment of periarthritis shoulder was divided into two parts -

1. General treatment,
2. Local treatment.

Under general treatment proper psychotherapy should be instituted to counteract anxiety and depression.

Poor muscular development and posture, inadequate nutrition and anaemia were treated by active postural exercises, supplementation of diet with vitamins and iron tablets.

Local treatment further divided into -

- i) Preventive,
- ii) Conservative,
- iii) Surgical.

- i) Preventive - The ideal is early use of injured part. Pendulum type exercises can be given.
- ii) Conservative treatment - The conservative treatment like Scott's dressing, heat application, exercises, Xylocaine infiltration, corticosteroids and manipulation with physiotherapy. Physiotherapy has been the sheet anchor in the treatment of periarthritis shoulder. It breaks the vicious cycle, as it breaks the 'disuse' a factor which play a major role in periarthritis.

Heat therapy in form of hydrotherapy, thermotherapy, electrotherapy, the latter as infra-red exposure and short wave diathermy, play an important role in the fight against periarthritis.

Anti-inflammatory agent as phenyl butazone 400 mg a day, glucocorticoids for short period upto 200 mg of hydrocortisone have also been claimed to give good results.

Sinha et al (1962) in their series of 30 cases used 1 c.c. (25 mg.) of hydrocortisone biweekly in 20 cases and Hostacortin 'H' (Prednisolone) crystalline suspension (1st injection 10 mg. and later 25 mg.) in the same interval. Complete relief of pain and stiffness occurred. Recurrence in their series was almost nil and intra-articular injections of corticosteroid definitely shorten the duration of treatment.

Mahaffey, H.W. (1963) advocated that adhesive capsulitis or 'Frozen shoulder' may result from any condition that causes pain about the shoulder. This is most often a self limiting disease with pain subsiding and motion gradually returning after 18 to 20 months. In a series he treated periarthritis shoulder by injection of steroid into the glenohumeral joint, with the patient sitting, the glenohumeral joint can easily be entered anteriorly. Physical therapy in the form of hot packs, diathermy, ultrasonic therapy and massage is usually helpful in relieving the pain.

Surgical treatment is indicated in that, who has not responded to conservative treatment. If one is certain that the bicipital tendon is the offending part, it can be resected and its insertion moved from the rim of glenoid to the proximal end of the humerus. This eliminates the sliding that occur on abduction and flexion and thus give great relief of pain. Following

this exercises, Codman or antigravity type are commonly employed. These are done with patient stooping at the hip to 90° and the arms hanging as a pendulum, in which position flexion, extension abduction, adduction and circumduction carried out. Once the pain subsides and more muscle power is gained, climbing the wall with the arm in abduction and wheel exercises is often beneficial.

Girgla and Grewal (1964) also supported the view that periarthritis of shoulder is a disease of older people. In series of 150 cases, 60 (40%) occurred in the 5th decade (Sinha et al., 1962; Naviaser, 1962). The disease has no predilection for either sex. The right shoulder (60%) is more commonly affected than the left (Lippmann - 72%). Bilateral occurrence had in 7% of cases (Neviaser, 1962 - 8%).

Any cause necessitating immobilization of shoulder especially in older people is ominous as it is quite likely to affect it with periarthritis.

Periarthritis is relatively more common in cases with generalised diseases like diabetes, and with disorders of cardiovascular and pulmonary system.

Pain is of diffuse nature in the region of shoulder and may radiate to arm, neck or towards back. All movements at shoulder restricted but abduction and

external rotation suffer the most. Later all movements disappear (Naviaser, 1962). Plain X-Ray of the shoulder is normal.

Girgla et al (1964) in an analysis of 150 cases achieved recovery of movements and relief of pain in majority of cases with the injection of hydrocortisone, hyaluronidase and xylocaine 2%, by going in between the greater tuberosity and lower surface of the acromion in an antero-medial direction for about 1 $\frac{1}{2}$ inches. Fomentation, with definite exercises, as crawling up the wall, attempting to touch the opposite buttock, shoulder and neck from the back, are recommended in every case.

Lee, M., Dip, T.P. et al (1973) in a series treated eighty patients of periarthritis shoulder. One group received infra-red irradiation together with a scheme of graduated active exercises. The second received an intra-articular injection of hydrocortisone acetate into the shoulder anteriorly and third received an injection of hydrocortisone acetate into the synovial sheath surrounding the bicipital tendon in the bicipital groove of humerus, followed by exercises. A fourth group received analgesics only.

Methods were devised for measuring abduction, internal and external rotation at the shoulder.

Measurement of Abduction - An assistant, standing behind the patient, fixed the shoulder by downward pressure over the acromion process, and limited rotation of scapula by grasping the inferior angle with other hand. A goniometer was placed in the axilla, the limb of goniometer parallel to the midline of the trunk and of the upper arm. The patient was then asked to raise the arm sideways as far as possible and the range of movement was measured in degrees.

Rotation - To record these movement, a cardboard circle was constructed, graduated in degree, through which patient arm was placed. By rotating the arm outward (external rotation) and inward (internal rotation), the rotation was measured.

The results of this trial showed that group receiving hydrocortisone benefitted more than the patients receiving analgesics only.

Steinbrocker Otto and Argynos, T.G. (1974) were included 36 patients (23 women and 13 men) in the study. The majority were more than 50 years of age. In six patients both shoulder were affected (Neviaser, 1962 - 8%; Girgla & Grewal, 1964 - 7%). On radiological examination two patients had calcific deposits at or about supraspinatus, and in 18 of the affected shoulder slight demineralization of head of humerus found.

In this series of 36 patients, 42 shoulders were treated by multiple, rotation, injection of corticosteroid at the affected site. Injections were given at three sites : subacromial bursa, the long bicipital tendon and the capsule of the shoulder joint by posterior route. In this series the medication was a depot preparation of prednisolone (50 mg/ml.), or triamcinolone (40 mg/ml.); 0.5 ml of any of these mixed with 2 ml of lidocaine (1%), at each site. In 28 shoulders (66%) the treatment gave abolition of pain after seven to 10 days. Recovery of approximately 85% of function, considered excellent relief, developed progressively within six weeks. The results were superior to those of other conservative measures such as analgesic and exercise, that are reported to require more duration to become normal.

Thakur, S.K. (1977) was found the periarthritis of the shoulder was one of the serious disabilities commonly seen in elderly people between the ages of 40 and 70. Periarthritis of shoulder was prevalent more in males than in females 1.50 : 1 and affection of right shoulder is more than left one, makes one think that this disability is due to stress and strain. This was because male are exposed to much more trauma and the right shoulder is subjected to greater strain as compared to left. He also found in his study that

mostly patients were heavy manual workers. Radiological investigation revealed calcification of supraspinatus tendon and sclerosis at the tip of greater tuberosity of humerus.

The patients presented with main complaints of pain and restricted joint motion and tenderness over tip of greater tuberosity, tip of acromion process, along the bicipital groove and over deltoid muscle. Some patients complained of acute pain, even during night awakening them from sleep. Majority of patients expressed their inability to comb the hair or to scratch the back. There was wasting of muscle of affected joint, specially the deltoid.

Thakur, in a study of 75 cases of periarthritis shoulder advocated gradual manipulative stretching of the joint along with infiltration of joint and periarticular tissues with hydrocortisone and lignocaine hydrochloride plus physiotherapy. The best result was obtained by the method of gradual manipulative stretching of the joint along with infiltration of joint and periarticular tissue plus physiotherapy. The next satisfactory result was obtained by method of intra-articular as well as periarticular infiltration of hydrocortisone and lignocaine plus physiotherapy.

Farocq Ashai (1978) divided the patient of painful stiff shoulder in two groups on the basis of limitation of movements. Those who could raise their arm to over 120° with respect to trunk were labelled as "periarthritis" and those who could not raise their arm to an angle of 120 degree were labelled as 'Frozen shoulder'.

In his study of 30 patient accounting for 34 Frozen shoulders, their age ranged from 36 to 68 years. There was no remarkable sex difference (Girgla and Grewal, 1964). The duration of the condition ranged from 2½ months to 2 years.

He treated 'periarthritis' shoulder with routine conservative measures like vigorous active exercises, local heat, short-wave diathermy, ultrasonic, analgesic, sedative and sometimes intra-articular hydrocortisone. Eventually these patients did get well. The patient of Frozen shoulder treated by manipulation under general anaesthesia followed by physiotherapy; good results were obtained in 73.5% and poor in 26.5%.

Singh et al (1980) treated 35 cases of periarthritis shoulder by manipulation under sedation following infiltration of hydrocortisone and gave encouraging results.

Bailey (1980) states that, a non-pyogenic inflammatory exudate causes the two layers of the synovia of the shoulder joint to adhere to one another and causes Frozen shoulder. Usually the patients between 40 - 60 years of age and more frequently female. The pain occurs at night, and prevents the patient sleeping on the affected side. Due to pain patient keeps the joint still, and stiffness of shoulder ensues. In a matter of months the 'freezing' process becomes so extensive that the head of humerus becomes glued to glenoid cavity and all movements of shoulder joint totally restricted. As the process becomes more complete, the pain abates. By this time the muscle around the shoulder show sign of disuse atrophy, but the trapezius not affected. This curious disease recovers spontaneously but the recovery may take upto two years. Later in 1983 Das supported the views of Bailey except that male more affected than females and spontaneous recovery can occur in 6-12 months.

Watson and Jones (1982) described that 'Frozen shoulder' occurs without previous significant injury and characterised by severe pain at rest. He advocated manipulation under anaesthesia of Frozen shoulder and satisfactory results achieved.

Bulgen, D.Y. et al (1984) in a study of 42 patients, 28 females and 14 males, with Frozen shoulder were followed-up closely for eight months. They were all

taught pendular exercises and randomly allocated to one of four treatment groups : (a) Intra-articular steroid, (b) mobilisation, (c) ice therapy, (d) no treatment. This study has shown that steroid injections may benefit pain and range of movement in the early stages of the condition.

Dacre, J.E. et al (1989) studied sixty six patients with a clinical diagnosis of periarthritis of the shoulder. Thirty five patients had right shoulder involvement and twenty seven the left; three had diabetes mellitus. In plain radiograph none had calcific subacromial bursae. Patients treated with physiotherapy, local steroid injections, or a combination of two - All had less pain and showed improved movement at six weeks and six months. Results suggested that local steroid injections are as effective as physiotherapy alone or combination of both; they provide rapid treatment and one less expensive.

Sharma, S. et al (1990) studied 83 shoulders in 77 patients of periarthritis shoulder. Age varied from 42 to 71 years. Peak incidence (35%) was seen in 50 - 59 years age group. There were 46 males and 31 females. Right shoulder was affected in 38 patients (49.4%) and left in 33 (42.8%) and six (7.8%) had bilateral involvement; 73 were manual labourers and four had sedentary jobs. Twenty one shoulders had sudden

onset and rapid progress, while 18 had insidious onset and slow progress of the disease. Initial assessment showed restriction of movements in all patients. There was no history of trauma. Associated diseases were diabetes mellitus in two, rheumatoid in one, osteoarthritis of knee in three.

Rick, T.E. et al (1991) treated forty eight patients (20 women and 28 men) of adhesive capsulitis by corticosteroid injections with lidocaine. The mean age of subjects was 5.5 years (range 40 to 70 years) and the mean duration of pain before the study was 13.2 weeks (8 to 18). The steroid preparation was used as methyl-prednisolone acetate 40 mg/ml. In each injection 1 ml was mixed with 2 ml of 1% lidocaine. Almost all patients reported satisfactory results.

Soodan, V.M. (1991) in a study of 100 cases of periarthritis shoulder, treated over a period of 1 years is presented. Out of 100 patients, 53 patients were male; 48 patients had right shoulder involvement, 58 cases had left shoulder and 2 cases had bilateral involvement. The mean duration of illness was 6.23 months. There were 9 patients with associated diabetes mellitus. X-Ray findings in some patients show osteoporosis, sclerosis of greater tuberosity of humerus.

The results of treatment of periarthritis shoulder by physiotherapy alone or in combination intra-articular injections of steroid or manipulation under general anaesthesia were evaluated and compared. The patients started showing improvement very early in both the injection group and manipulation group.

MATERIAL AND METHODS

MATERIAL AND METHODS

All the cases of Periarthritis shoulder were collected from the Out Patient Department of M.L.B. Medical College Hospital, Jhansi.

Out of the hundreds of patient coming to the Out Patient Department with the complaints of pain in the shoulder and for loss of movement at shoulder partially and completely, fifty cases conforming with the clinical diagnosis of 'periarthritis' or 'Frozen' shoulder were selected.

The criteria for diagnosis of Periarthritis shoulder and selecting the cases for this clinical study was as suggested by many authors, that is pain and stiffness and loss of function of the shoulder joint, with or without a history of injury. No cases associated with multiple arthritis were considered. Cases doubtful of tuberculosis were also not included.

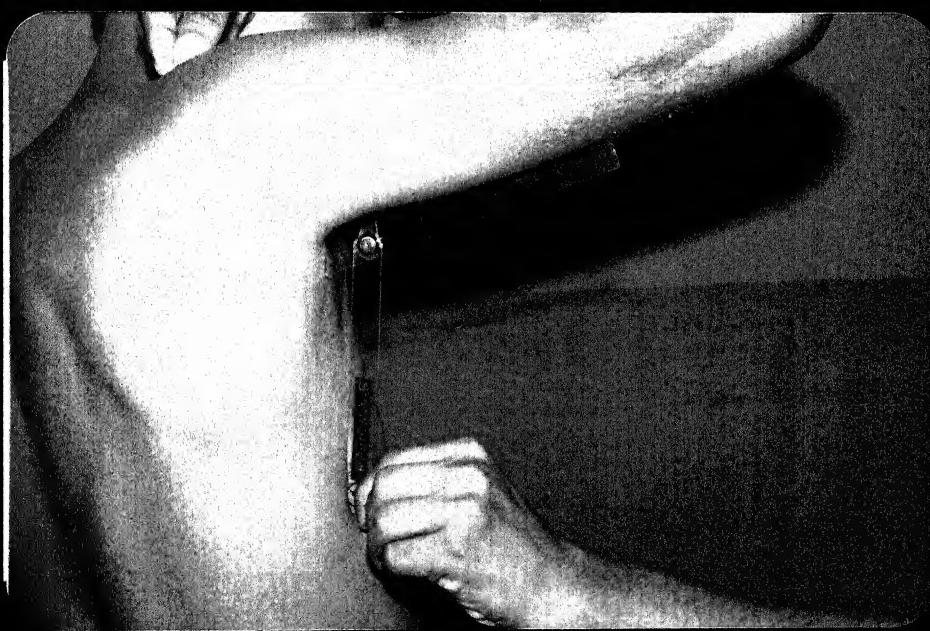
All cases of periarthritis of shoulder following definite dislocation, fractures about the shoulder, were omitted from this study.

The diagnosis has been made after carefully going into the details of history and complete physical examination of the patient. Before recording the complaints the details of age, sex and occupation were noted. Then the chief complaints and the history of present illness were enquired into. In the history of present illness special care was taken to find out the mode of onset, site of pain, duration and radiation of pain and the duration of stiffness. Patients were also asked as to whether they had any neck pain, pain in elbow or any other joint complaints. History of trauma were taken. The right or left handedness were taken. A perfect past history regarding pulmonary tuberculosis, coronary disease, metabolic disorder was carefully recorded.

On general examination of patient, special attention was paid to study the mental make-up of the patient and his sleep, attention was also paid as to whether he had any other joint disease, any foci of infection, or some other cause which has led to the disuse or immobilisation of shoulder joints.

Restriction of movements of the cervical spine if any and tenderness in the cervical spine were recorded.

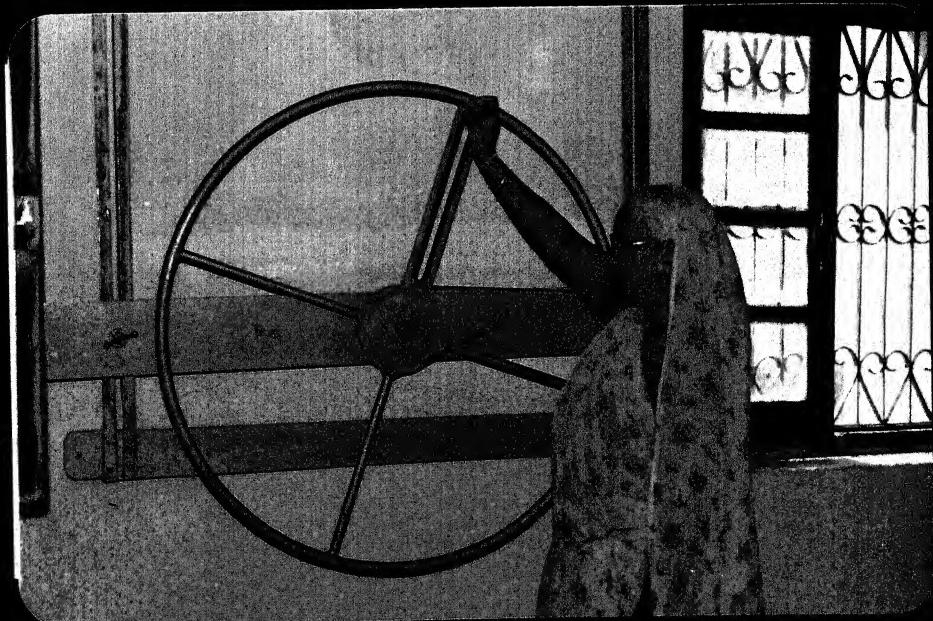
Local examination of the shoulder was then done carefully on both sides. The deformities, atrophy of





Pendulum
opendie

Wall - creeping
diele



1960 - 1961 - 1962 - 1963 - 1964 - 1965

hair ?, can he dress himself ?, can he rub interscapular region, other side of neck, other side of back of shoulder and front of shoulder ?, can he touch the back of head (occiput) with the fingers of hands with the shoulder abducted and elbow flexed in coronal plane ?

Neurological examination were conducted by paying attention to the hand and fingers and by comparison of both side.

After the clinical examination, all the patients were subjected to routine blood examination which include haemoglobin percentage, total and differential white cell count and erythrocyte sedimentation rate. Blood sugar level were also estimated. Urine was examined for sugar, albumin and routine microscopic study. Investigation on rheumatoid factor was done in whichever case it needed.

Roentgenological examination of involved shoulder in all patients of periarthritis shoulder were examined. Routinely anteroposterior view and axillary view of the affected shoulder was done.

Postero-anterior X-Ray of the chest was taken in required cases to rule out any lung pathology.

After completion of these investigations, the patients were treated by one of the methods described below.

Fifty patients were divided into 4 groups and evaluation of different therapies were done only on clinical assessment of the cases. No surgical method of treatment was aimed, as these conservative lines of treatment gave considerably good results. Though clinical evaluation is not a true quantitative analysis, because of the lack of any satisfactory laboratory test or any bioassay methods to assess the activity or progress of the disease, reliability based on it.

The psychological problems of the patient were given due attention before the local treatment for shoulder was started, and anaemia, malnutrition or any other associated diseases were treated.

Methods of Treatment :

1. Analgesics only.
2. Physiotherapy plus analgesics.
3. Intra-articular hydrocortisone injections with physiotherapy and analgesics.
4. Analgesics plus Intra-articular hydrocortisone injection.

Described below are the details of the various methods of treatment adopted.

Physiotherapy :

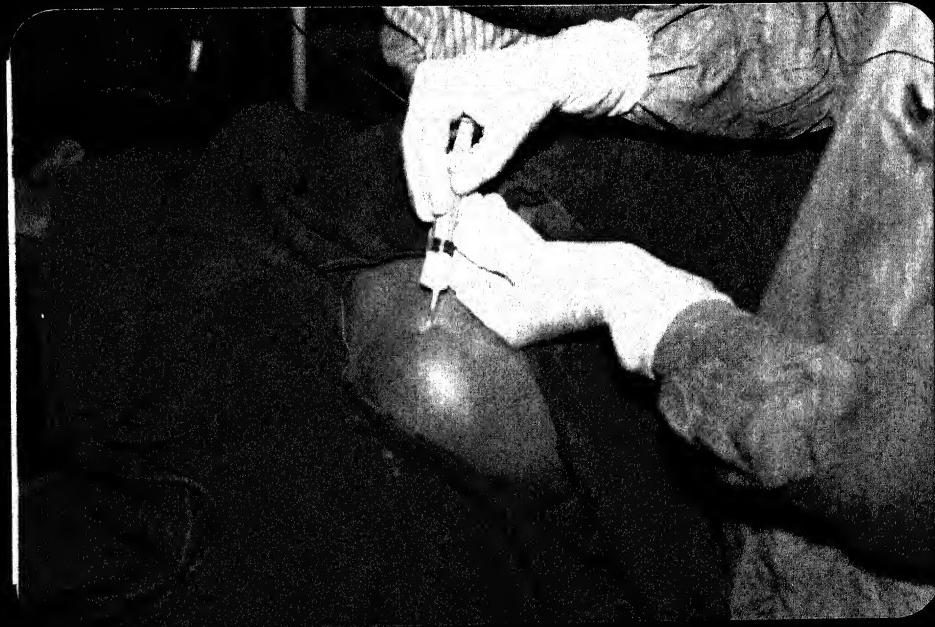
Physiotherapeutics measures were in favour of various remedial exercises and in various forms of heat.

It was Codman (1930) who first emphasized the use of exercises in 'Frozen shoulder'. Exercises which form the fundamental basis of treatment was taken of special care. Much pain was taken to convince every patient, of the importance of exercises and regularity of treatment and they were made to understand that the more efforts puts to use the painful shoulder and faster will be the recovery.

The active movements by the patients were of far greater value than passive movements by Therapist. Exercises can be best given when the severe agonising pain decreases. 'Stooping exercises', in which the patient bends forward from the hip and swings the straight arm in and circle and, in various directions when the arm can be moved freely. The patients actively begins to swing his arm forward and backward, and from side to side. Gradually the active movements against gravity should be instituted as turning of wheel, crawling up of the wall exercises to encourage motion in parasagittal plane, making a mark on wall each day to estimate the progress. Sliding the arm on a smooth level, so the weight of limb is overcome and hyperabduction exercises



site of injection



site of injection

site of injection

of the Codman for abduction, asking the patient to touch the nape of the neck and the opposite shoulder and the back for rotations.

A similar technique was used to produce alternate medial and lateral rotation with elbow flexed to 90°. Later strengthening resistance exercises for confidence and power. The patients were asked to practice these exercises three or four times daily for 10-15 minutes each session.

All the patients were sent to physiotherapy section attached to Orthopaedics Department and were advised to continue the exercises at home.

Intra-articular Hydrocortisone :

Procedure adopted - The injections were given with due regard to asepsis, in the operating theatre. The patient was made to lie on the O.T. table. Skin preparation carried out and draping done. A ten c.c. syringe was used with two 20-gauge needles. 2 c.c. of hydrocortisone solution was mixed with 2 c.c. of 2% Xylocaine. Two sites were used for intra-articular injection.

- (i) Anterior route - A needle is entered just lateral to tip of coracoid process, and pushed in a direction backwards, outwards and upwards, with the patient lies supine on table.

(ii) Posterior route - A needle is entered just lateral to the angle formed by the junction of the acromion with the spine of scapula. The needle is pushed in forward and upward direction. This route is used by patient lies prone.

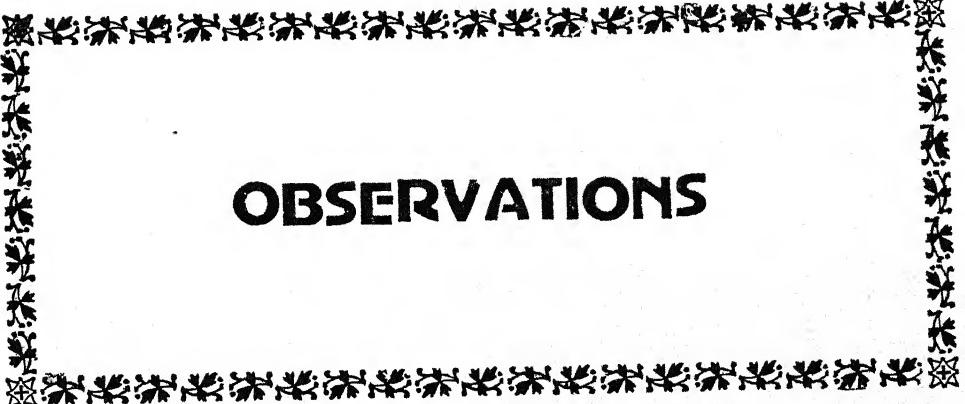
After the needle was inserted through the selected site, as soon as the synovial membrane pierced, a 'giving' sensation was apparent on entering into the joint space. The presence of needle tip in joint space was ascertained by its free movements and the hydrocortisone injected into the space goes freely, and without resistance. When sure of the needle in joint space, the drug was pushed. The needle was then taken out and injected areas were sealed with tincture benzoin. Then the shoulder was moved in all direction for 2-3 minutes. All the patients were warned of the possibility of increase of symptoms for about 24 hours. They be told to take analgesics. The patients were allowed to go home. Patients were called for check-up and assessment once a week and depending on the effect of the cure, the injections were repeated.

All the group of patients were called for the assessment of results done on the 1st day, 1st week, 2nd week, 4th week, 6th week, 12th week and progress watched for -

1. Subjective and objective pain relief.
2. Performance of shoulder movements.

The assessment of results :

	<u>Pain</u>	<u>Movements</u>
1. Good	No pain.	No or little limitation of movements.
2. Fair	Minimal pain.	No or little limitation of movements.
3. Poor	No pain or slight improvement.	Marked limitation of movements.



OBSERVATIONS

OBSERVATIONSTable - IAge incidence and the side of involvement.

Age group in years	Side		Cases	
	Lt.	Rt.	No.	Percentage
11 - 20	-	-	Nil	0.0
21 - 30	-	1	1	2.0
31 - 40	1	6	7	14.0
41 - 50	9	14	23	46.0
51 - 60	3	6	9	18.0
61 - 70	3	6	9	18.0
71 - 80	-	1	1	2.0
81 - 90	-	-	Nil	0.0
Total	16	34	50	100.0
Percentage	32.0	68.0	100.0	

As evident above, out of 50 patients, who were studied in the present work, the majority belonged to age group of 41 - 50 years, in which there were 23 patients (48%). The youngest patient was of 28 years of age, the oldest was 77 years. The average age incidence was 46.23 years.

Table - I also showed a predominance of right side involvement with 68% as compared to the left side (32%). Bilateral involvement was not encountered.

Sex incidence :- Sex incidence among 50 cases was as follows :

Table - II

Sex incidence.

Sex	No. of cases	Percentage
Male	31	62.0
Female	19	38.0
Total	50	100.0

Ratio Male : Female = 1.63 : 1

Occupation :- The incidence of occupation has been observed as follows :

Table - IIIOccupation.

Type of work	Total	Percentage
A. <u>Heavy work :</u>	9	18.0
- Farmers	3	
- Labourers	4	
- Mechanic	2	
B. <u>Light work :</u>	12	24.0
- Teachers	3	
- Tailors	2	
- Drivers	1	
- Technician	2	
- Policewala	1	
- Advocate	3	
C. <u>Sedentary work :</u>	29	58.0
- Officers	2	
- Housewives	14	
- Retired employees	3	
- Clerk	7	
- Business	3	
Total	50	100.0

In this series, 14 different occupation were seen. It has been observed that 58% of the patients were sedentary workers. Housewives formed the largest group 14 (28.0%).

Table - IVHandedness

Side of affection	Handedness				Total
	Right		Left		
	No.	%	No.	%	
Right side	31	91.17	3	5.88	34
Left side	13	81.25	3	18.75	16
Total	44		6		50
Percentage	88.0		12.0		100.0

Out of the total number of cases, 44 (88%) were right handed persons and six (12%) were left handed. 91.17% of the persons who had right sided lesion were right handed and 18.75% of the persons who had left sided lesion were left handed. Out of fifty cases, master hand was involved in 68% cases.

Table - VMode of onset.

Mode of onset	No. of cases	Percentage
Insidious	41	82.0
Acute	9	18.0
Total	50	100.0

The insidious onset of symptoms were about four times more common than the acute onset (from few days to one month).

Table - VI
Duration of symptoms.

Duration of symptoms before the treatment started	No. of cases	Percentage
Less than 15 days	6	12.0
From 1/2 month to 1 month	3	6.0
From 1 to 2 month	9	18.0
From 2 to 3 months	9	18.0
From 3 to 6 months	19	38.0
From 6 to 12 months	3	6.0
From 12 to 18 months	1	2.0
Total	50	100.0

The majority of patients (38%) had the symptoms between 3 to 6 months. There were only one patient with the symptoms more than one year and nine patients (18%) complained of symptoms present within one month. The shortest duration of symptoms was seven days in a 28 years old man and the longest was 1½ years in an old lady of 68 years.

Table - VIIHistory of trauma.

History	No. of cases	Percentage
Direct trauma	4	8.0
Indirect trauma	3	6.0
No trauma	43	86.0
Total	50	100.0

There was history of trauma in 14% of the cases, eight percent of them were due to the direct injuries to the shoulder. These were mainly contusion or sprains due to direct fall on the shoulder or due to a direct hit. Six percent of the cases had a history of indirect trauma and this included injury around elbow, forearm, wrist and hand. Eighty six percent of patients had no history of trauma.

Table - VIIIRadiation of pain.

Site of radiation of pain	No. of cases	Percentage
Upto arm	14	28.0
Upto forearm and fingers	5	10.0
Localised only to shoulder	31	62.0
Total	50	100.0

Table - IXSeverity of pain.

Severity of pain	No. of cases	Percentage
Mild	9	18.0
Moderate	27	54.0
Severe	14	28.0
Total	50	100.0

It was observed that nine of the 50 cases had mild pain and it caused little inconvenience to the patient in their work. In 27 patients pain was of moderate severity. The remaining 14 (28%) patients, had such severe pain that they completely avoided using the affected arm and most of them pleaded for immediate relief. Irrespective of the severity of pain, in majority of the patients pain was present both at rest and on motion.

In 14 (28%) of the 50 cases there was radiation of pain to outer aspect of arm denoting C₅ root lesion. Only in five cases there was radiation of pain in forearm and tingling sensation in the fingers. In majority (62%) of patients, pain localised only to shoulder.

Local examination of the affected shoulder revealed that a total of 13 patients had definite evidence of wasting of the muscle around the shoulder. There was wasting of supraspinatus, infraspinatus and deltoid muscle.

Association with other diseases :- The following table shows the association of these 50 cases of periarthritis shoulder with other diseases.

Table - XAssociated ailments.

Disease	No. of cases	Percentage
Diabetes	7	14.0
Coronary disease	3	6.0
Pulmonary tuberculosis	2	4.0
Leprosy	1	2.0
Cervical spondylosis	3	6.0
Total	16	32.0

It was observed that as high as 32% of cases had association with other diseases. Among these cases, except in diabetics (14%), immobilisation in one way or the other has played a major role for the development of shoulder problem. For instance, either the patient was afraid to move his shoulder because of the fear that any activity may deteriorate the heart or lung; or because of increase of pain during any movement had been attributed due to cardiac in origin.

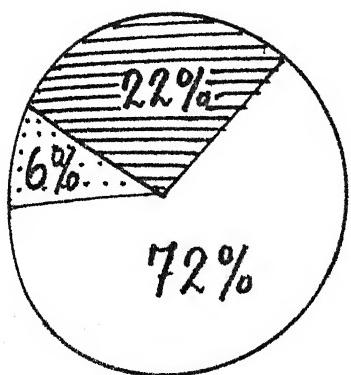
Table - XITenderness.

Site of maximum tenderness	No. of cases	Percentage
Along biceps tendon	29	58.0
In region of subacromial bursa	9	18.0
Diffuse	5	10.0
No tenderness	7	14.0
Total	50	100.0

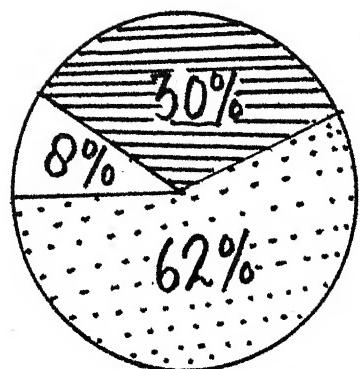
In as many as 29 (58%) cases, there was definite tenderness along the biceps tendon. In many cases there was more than two to three tender spot. In seven patients, no tenderness was found.

Limitation of movement :- The following table shows the limitation of different movements in 50 cases.

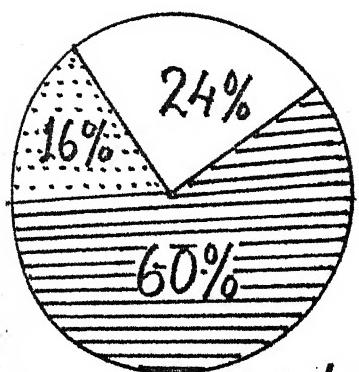
Table - XII



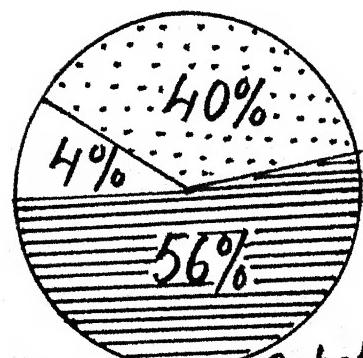
Abduction



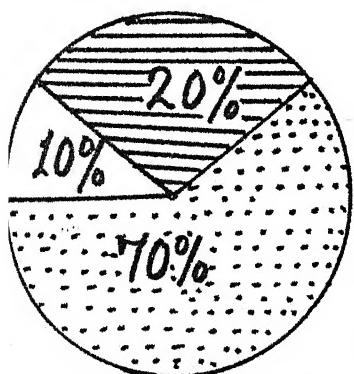
Adduction



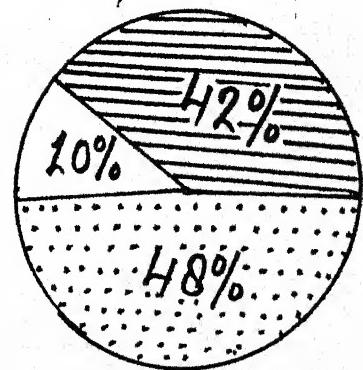
External Rotation



Internal Rotation



Flexion



Extension

Mild. limitation of movements in patients (%).
 Moderate. depicted in pie-diagrams.
 Severe.

As the above table indicates, it was observed that as many as 72% of cases had severe limitation of range of abduction and only six percent had mild limitation of abduction movement.

Adduction which was tested by means of "Scapular test of Farkas". Though adduction was restricted in majority of cases, it was only hampered (mild) i.e. the patients could almost touch the opposite shoulder in as many as 62% of cases and in only eight percent of cases, it was severely restricted.

External rotation was restricted more than the internal. It was observed that maximum number of patients had limitation of external rotation 60% between 20° - 60° and only 16% had external rotation of more than 60° whereas 40% of the cases had more than 60° of internal rotation; and only four percent had range of internal rotation below 20° .

Flexion movement compared to other movements was much more free. Only 10% cases had severe limitation of flexion movement and majority of cases 70% had more than 90° of flexion.

Complete restriction of extension was not seen in a single case. But majority of the cases had restriction of extension above 40° . In 42% cases there was moderate limitation of extension.

When all the movements around the shoulder of all these cases were finally assessed and reviewed, it was observed that more than 70% of the cases had restriction of movements in all planes.

Roentgen findings :- A skiagram of all patients were taken. In most of the cases there was reported "an abnormal finding negative". In some cases (seven) (14%) , there was osteoporosis seen.

Routine blood examination such as red blood cell count, haemoglobin percentage, white blood cell, total and differential count and erythrocyte sedimentation rate could be determined. In all cases, RBC count was in between 4 to 6 million per cmm. and the WBC count was in between 6 to 10,000 per c.m.m. The haemoglobin value varied from 9 to 15 gm% in majority of cases. ESR varied from 10-20 mm in 1st hour. Blood sugar examination showed increased level in seven cases.

Treatment :

In this series, the results are shown in four different modes of shoulder treatment which was received by four groups of subjects. The results as shown below has been tabulated to show the four different modes of treatment used in this series to the responsiveness of the patients to the same -

Holmes Shengard - 1889
in California

<u>Treatment</u>	<u>No. of cases</u>
1. Analgesics	8
2. Physiotherapy plus analgesics	18
3. Physiotherapy plus analgesics plus intra-articular hydrocortisone	15
4. Intra-articular hydrocortisone plus analgesics	9

1. Analgesics :- The table below shows the comparison of various duration of treatments (in weeks) to the response in patients (as percentage).

Table - XIII

Duration (weeks)	Total cases	Good		Fair		Poor	
		No.	%	No.	%	No.	%
0 - 2	8	-	-	4	50.00	4	50.0
2 - 4		-	-	3	37.5	5	62.5
4 - 8		-	-	-	-	8	100.0
8 - 12		-	-	2	25.0	6	75.0
12 - 16		-	-	2	25.0	6	75.0

From the above it is very clear that no patient whatsoever (0%) could get a good response from this mode of treatment. However, fair response could be elicited with the majority (50%) lying in 0-2 weeks of treatment.

Moreover, varied percentage of patients (25% - 37.5%)

showed some fair response 2 - 16 weeks of treatment.

The poor response gradually showed a linear rise with the increase in duration of treatment and thus either the pain or movement disability reappeared. It was quite interesting to learn that in 4-8 weeks treatment, group shows the failure rate upto 100%. In contrast, further treatment (in weeks) certain fair response (25%) reappeared. This can be explained by the fact that the patient differed from taking treatment and thus showed this variable clinical response in this duration of follow-up.

2. Analgesics plus Physiotherapy :-

Table - XIV

Duration (weeks)	Total cases	Good		Fair		Poor	
		No.	%	No.	%	No.	%
0 - 2	18	-	-	6	33.32	12	66.66
2 - 4		-	-	3	16.66	15	83.33
4 - 8		-	-	3	16.66	15	83.33
8 - 12		1	5.55	7	38.88	11	61.11
12 - 16		2	11.11	9	50.00	7	38.88

The above table showed that out of 18 cases, two cases (11.11%) could get a good response in 8 - 16 weeks of treatment. During 2 - 8 weeks of treatment maximum poor response (83.33%) was observed. This table clearly showed that during initial period of treatment the response

was not so encouraging but later periods showed more better response with gradual increase in duration of treatment.

3. Analgesic plus Physiotherapy plus intra-articular hydrocortisone :-

Table - XV

Duration (weeks)	Total cases	Good		Fair		Poor	
		No.	%	No.	%	No.	%
0 - 2	15	-	-	8	53.33	7	46.66
2 - 4		-	-	6	40.00	9	60.00
4 - 8		1	66.66	5	33.33	9	60.00
8 - 12		2	13.33	7	46.66	6	40.00
12 - 16		3	20.00	8	53.33	4	26.66

The above table showed that in 0 - 2 weeks of duration of treatment eight cases (53.33%) reported fair response, 46.66% reported poor response. No good response was reported in 0-4 weeks of treatment. Maximum patients (73.33%) were relieved of their pain and movement disability in 12-16 weeks of treatment. It was observed that this group of treatment had more sustained action throughout this duration of follow-up. In two patients more than one injection of hydrocortisone was given, thereafter second injection showed fair response.

The complication noted as exacerbation of pain in the first twenty four hours was seen in about 75% of the cases, but with analgesics the pain subsided in most of them. It was observed that those patients who were irregular and irrelevant to exercises had the misfortune of prolonging their disability.

4. Analgesics plus Intra-articular hydrocortisone :-

Table - XVI

Duration (weeks)	Total cases	Good		Fair		Poor	
		No.	%	No.	%	No.	%
0 - 2	9	-	-	6	66.66	3	33.33
2 - 4		-	-	6	66.66	3	33.33
4 - 8		1	11.11	2	22.22	6	66.66
8 - 12		1	11.11	3	33.33	5	55.55
12 - 16		1	11.11	2	22.22	6	66.66

This table showed that only one patient (11.11%) could get a good response in 4 - 8 weeks duration of treatment. Initially the response was fair in 66.66% of cases but in later periods of treatment improvement decreased and maximum poor response observed in 12-16 weeks duration of treatment.









DISCUSSION

DISCUSSION

A study of the voluminous literature on painful shoulder revealed that the factor causing this syndrome are most varied. As the nomenclature used by many authors is vague and inconsistent and as many writers have included many different disease states under the diagnosis of periarthritis shoulder, it was found necessary to define the concept of periarthritis of shoulder as precisely as possible. It was possible on the basis of this twelve month period of observation, to exclude, cases of specific diseases with characteristic sign and symptoms and select only a uniform group of cases with typical clinical findings.

Concurrent with the advancement of numerous theories concerning the etiology of periarthritis there developed different and quite often contradictory concepts regarding its treatment. It is imperative to know the pathogenesis of an entity, if its treatment is to be rational and successful. Thus, as the pathogenesis of periarthritis is still ill understood, its treatment described by many authors has been empirical. Hence, an attempt has been made here to study the natural

history and clinical signs and symptoms of this disease in detail and to assess the results of various lines of treatment.

Age incidence :

This clinical entity mainly affects people in the 5th decade of life and its incidence gradually tapers off towards the younger and older ages (Codman, 1930). The average age incidence reported by most of the authors is between 45 and 55 years. Average age as observed by various authors is compared with the present series in the following table.

Name of author	Year of publication	Average age
Codman	1930	53 years
Sinha et al	1962	49.3 years
Neviaser	1962	52.8 years
Bulgen, D.Y. et al	1984	55.8 years
Rizk, T.E. et al	1991	55.7 years
Present series	-	45.5 years

Average age in the present series coincide well with the observations of authors. The incidence is higher in elderly people because persons are more prone to stress and strain of modern life both mentally and physically

during fourth and fifth decade of life. Coventry (1953); Tyber (1974) and Rizk (1982) believed that 'Frozen shoulder' occur in a person with 'periarthritic personality' which is a state of 'poised indecisiveness' an inability to express the tension freely.

Sex incidence :

About sex involvement, the periarthritis shoulder affects both sexes. In the present study, it was found that there was a notable male predominance (62%). The male : female ratio being 1.63 : 1. This finding too is in accordance with the findings of Travell, J. (1942) - 63.8% ; Thakur, S.K. (1977) with ratio 1.5 : 1. Sharma, S. et al (1990) - 55.42% ; Soodan, V.M. (1991) - 53%, but against the finding of Codman (1930) - 42%. Lippman (1943) - 35%, Sinha et al (1962) - 46% claimed female predominance.

The higher incidence of males in the present study may be due to the males being affected by more routine stresses and strains than the indwelling females in our community, which causes attenuation of the muscle and capsule. It may also be attributed to the larger turnover of males in the out patient Department than female patients.

Occupation :

In the present series, the maximum percentage of patients involved in sedentary works (58%) included

the shoulder in rest or relatively 'disuse' for sometime during which metabolic changes in the tissues occur. Moseley (1952) explains that little trauma, perhaps, of 'over-strain' also can give to changes of 'reflex dystrophy' in the tissues around the shoulder.

Mode of onset :

In majority of the patients, the onset is insidious, 82% in our series. Insidious nature of onset of periarthritis is well known. In this series, 18% cases had acute onset (from four days to one month) of symptoms and was due to trauma to shoulder.

Duration of symptoms :

The duration of symptoms before a patient presents himself to the hospital, usually varies from one month to one year. Table shows this comparative study. In this series, the average duration is 4.37 months. It is in accordance with the findings of Sinha et al (1962) - 4.62 months; Neviaser (1962) - 4.82 months.

Duration of symptoms depends on several factors like severity of symptoms, availability of time for the patients to attend the hospital and education and health outlook of patient. In general, it was seen that most of the patients neglected the early phase of disease and attended the hospital after 2-3 months of their ailment

when pain and stiffness has markedly set in. In my analysis, patients came late to hospital, because in early periods of disease, they did not worry for treatment as they had only dull aching pain in the shoulder and without being much disabled.

Trauma :

Traumatic etiology of periarthritis, whether direct or indirect, had its supporters in the past. But it is a fact recognised by all, that, most of the patients do not give a definite history of trauma at all. The table below shows the percentage of cases, with history of trauma.

Name of authors	Percentage of cases with history of trauma (direct or indirect)
De Palma (1961)	35%
Neviaser (1962)	21%
Sinha et al (1962)	38%
Present series	14%

The above table signifies low incidence of traumatic cases.

It is the minor trauma which initiate the disease perhaps by causing 'sympathetic reflex dystrophy'

(Coventry, M.B., 1953; and Steinbrocker, O., 1974) or 'functional disuse' and this minor initiating trauma is usually forgotten by the patients.

Pain and Periarthritis :

Coventry (1953) has emphasized that the initial cause of periarthritis is pain which may be mild or severe. This may brought about by minor trauma or sprain or twist of the shoulder joint. Lippman (1945) talks of pain in these patients as varying from mild to very severe degree. In the present series, most of the patients came with complaints like inability to comb their hair, clean their back while taking bath, inability to lift the arm. Twenty eight percent of the patients could not do or go for their work because of severe pain. Fifty four percent of patients who had moderate pain did go for their work, but with much displeasure and discomfort. Only 18% of the patients who had mild type of pain could do their jobs. Sometimes pain may be so severe that the patient can not sleep and walk all the night in the room with his limb supported by the side, and an adduction and internal rotation contracture develops due to constantly keeping the limb in that position of rest. In the present series, 28% of patients had radiating type of pain from shoulder to outer aspect of arm denoting a C₅ root lesion. In 10% of the patients, there was a radiation of pain along dorso-lateral aspect

of forearm, which in some cases extended upto fingers, suggesting a C₆ root compression. But it was interesting to note that none of these patients had any neurological deficit. Klami (1962) detailed a correlation of cervical spondylosis with periarthritis in 67 out of 138 patients who had definite segmental sign and symptoms.

The pain initiated in any way causes direct 'sympathetic' disturbance, resulting in 'reflex dystrophy' or by operating through factor of 'functional disuse' resulting in metabolic changes in the tissues (De Palma and Neviaser).

Association with other disease :

It has been suggested in the literature that disease in the other organs could be capable of influencing the susceptibility to periarthritis shoulder. Fourteen percent of the cases in the present series were diabetics. This finding is in accordance with the report of Soodam, V.M. (1991) who reported 9% association of diabetes in their patients. Out of 50 cases, 3 cases had association with coronary disease. This is in coincide with Howard (1930), who presented five cases of periarthritis shoulder with coronary disease. The other associated diseases were pulmonary tuberculosis, leprosy, cervical spondylosis. Immobilisation in one way or the other has played its role.

Tenderness :

This cardinal sign is an important clinical feature of periarthritis shoulder. In the present series, 54% of cases are those who had maximum tenderness in the bicipital groove (Lippman, 1951 - 90%; De Palma, 1961 - 72%). This high percentage of tenderness in the bicipital groove in the present series is a clear indication that biceps tendon by all possibilities is one of the probable instigator of periarthritis shoulder.

Tenderness is present usually in all cases with acute pain, and in painful phase of disease, and disappear in convalescent stage. In late cases deep pressure is required to elicit tenderness. It may be said that those 14% cases, where tenderness could not be elicited may be progressing towards resolution.

Movements :

Limitation of movement is the second important presenting symptom and one of the important sign in periarthritis, is a common view of almost all the authors. They differed only in fineness of movement and restriction of the type of movement. Moseley (1953) felt that in the earlier stages there would not be any limitation of movement but Sinha (1962) and Neviaser (1962) and Sharma, S. et al (1990) have described limitation to be

quite an early feature in all the cases. In present series early cases had showed certain amount of limitation. Early limitation in these cases was mainly due to the spasm of the muscle. Neviaser (1962) and Sinha et al (1962) and various other authors are of the view that passive movements are almost the same as that of the active one. In this series, in majority of cases it was so. Lippmann (1957) have claimed that periarthritis mostly causes limitation of abduction and rotation movements only, but in our series 72% of the cases had restriction of movements in all planes. This coincides with the view of Bailey (1980), Neviaser (1962) and Moseley (1953). It may be due to the fact that majority of the cases in this series had their duration of symptoms between 3 to 6 months.

Considering the limitation of different movements, which has been enlisted in detail under the observation, the following findings almost agree with the findings of De Palma (1951); Sinha et al (1962); Neviaser (1962).

1. Limitation of abduction was a common feature in almost all cases. Seventy two percent cases had abduction below 60° and only six percent had above 100° . So limitation of abduction is a significant feature of periarthritis and it is this limitation of movement that the patient is most bothered.

2. Considering the two types of rotations, external rotation was more limited than the internal rotation. Eighty four percent of cases had less than 60° of external rotation whereas only 60% had less than 60° of internal rotation. This shows that the external rotation is more often the target than the internal one.
3. Adduction which has been claimed by the above authors as the pathognomonic sign of periarthritis was no doubt restricted in majority of cases in the present series and in contrast severe restriction was present in only eight percent of cases.
4. Range of flexion comparatively was much more free than other movements. Ninety percent of cases had more than 90° of flexion. Because of the forward movement of the scapula around the chest by $20^{\circ} - 30^{\circ}$, there is a likelihood of exaggeration of the flexion movement. Extension which is less stressed by the author, was found restricted in most of the cases.

On final assessment of limitation of movement as a whole, it was found that in majority of cases initially it was pain either radiating or localised which has caused the limitation of movements. Because all these patients had pain at the limits of motion and the patients being afraid to move the shoulder further, it resulted in more restriction.

Roentgen appearance :

Even though no radiological abnormality was evidenced by many of the author (Lippman, 1943; Girgla and Grewal, 1964; Dacre, J.E. et al, 1989), but few of them could elicit radiological abnormalities. Steinbrocker (1974) and Soodan, V.M. (1991) reported presence of osteoporosis in some of cases. In present series, osteoporosis was present in only 14% of cases. Osteoporosis noted in these cases can be attributed mainly to disuse. Rest of patient had no radiological abnormalities.

Treatment :

Analgesics :- The role of analgesics in early cases of periarthritis has been stressed by many authors (Redding, 1964). The relief of pain by analgesics is said to diminish the muscle spasm and give dramatic relief. But there was equally quick recurrence of symptoms, because as the action of analgesic waned off, pain reappeared and vicious cycle commenced again.

Analgesics plus physiotherapy :- Physiotherapy plays a very important role to break 'vicious cycle' of periarthritis where 'disuse' factor has been given the major role. Exercise of various types, form the fundamental basis of treatment of periarthritis shoulder (Codman, 1930;

Neviaser, 1962), because they help to mobilize the shoulder joint and to maintain the increasing range of motion gained by them, to restore muscle power and co-ordination of movement. Heat is said to help circulation, relieves pain and spasm. In present series though there was improvement in 61.11% of cases, but they took more than 12 weeks treatment.

Analgesics plus Physiotherapy plus Intra-articular hydrocortisone :- In this present series, 73.33% patients showed improvement (20% good response and 53.33% fair response). This is in accordance with the results of De Palma (1961) - 80%; Sinha et al (1962) - 100%. Girgla and Grewal (1964); Thakur, S.K. (1977); Farooq Ashai (1978), have reported excellent results with hydrocortisone.

The action of hydrocortisone is said to be anti-inflammatory and in a reparative phase, it prevents the formation of fibrin and in growth of fibroblasts. Stein and Billar (1953) found that hydrocortisone inhibited the formation of granulation tissue, thereby interrupting the vicious cycle of initial repair. Exercises maintain the improvement achieved.

Exacerbation of pain within the first 24 to 36 hours was much more common with hydrocortisone but they settled down with analgesics.

When compared to the other line of treatment local injection of hydrocortisone is no doubt a great step achieved in solving the problem of these patients. The duration for developing relief of symptoms is much less by this method and a patient can go back to his work much earlier. Hydrocortisone is contra-indicated in diabetes patients.

Analgesics plus Intra-articular hydrocortisone :- In the present series, it was found that during early period of treatment, there was little difference of alleviation of symptoms between this group of patients and those who got Physiotherapy apart from above modes. But later the symptoms reappeared and may be because of absence of Physiotherapy.

Comparison of results with all four modalities of treatment.

Results (At 12th week)	TREATMENT							
	Analgesics only		Analgesics + Physio- therapy		Analgesics + Physio- therapy + I/A Hydro- cortisone		Analgesics + I/A Hydro- cortisone	
	No.of cases	%	No.of cases	%	No.of cases	%	No.of cases	%
Good	Nil	Nil	2	11.11	3	20.00	1	11.11
Fair	2	25.0	9	50.00	8	53.33	2	22.22
Poor	6	75.0	7	38.89	4	26.67	6	66.67
Total	8	100.0	18	100.00	15	100.00	9	100.00

Regarding the progress of treatment at 12th week with different modalities revealed :

- (a) None of eight patients on treatment with analgesics only showed good response, while fair response was found in only 2 (25%) cases. However, six cases showed poor response (75%).
- (b) Two cases (11.11%) on treatment with analgesics as well as physiotherapy showed good response while in nine cases (50%) a fair response was obtained. However, seven of the cases (38.89%) showed poor response.
- (c) Three cases (20%) on treatment with analgesics and physiotherapy along with hydrocortisone showed good response, while eight cases (53.33%) showed fair response. However, four cases (26.67%) showed a poor response.
- (d) One case (11.11%) on treatment with hydrocortisone plus analgesics showed good response while two cases (22.22%) showed fair response to the treatment.
However, six cases (66.67%) showed a poor response.

Thus,

1. The maximum failure (poor results) were obtained in the modality of treatment where only analgesics were given.

2. When the poor results of analgesics and analgesics plus physiotherapy modes are compared, the later shows a drastic decrease in this reference. It suggests that physiotherapy has a main stay in combined modalities.
3. Lowest failure was when the analgesics were given in combination with physiotherapy and hydrocortisone. Thereby suggesting a further improvement by hydrocortisone in comparison to analgesics and physiotherapy.
4. Finally, it is seen that analgesics plus physiotherapy plus hydrocortisone shows the maximum percentage of good response in comparison to all other three.

CONCLUSION

CONCLUSION

This conclusion is based upon the observations made in this study conducted over the patients in the Department of Orthopaedics of M.L.B. Medical College, Jhansi, during a period of 12 months. After thorough examination and investigations, fifty patients were selected for study. The conclusions drawn were as follows :

1. Periarthritis of shoulder is usually the problem of middle aged person in fourth and fifth decades of life.
2. Males are affected 1.63 times as commonly as females.
3. Persons who are involved in sedentary work are more prone to develop problem of periarthritis shoulder.
4. The right side lesion is two times more common than left side and the disease more commonly found in master or working hand (68%).
5. The insidious onset of symptoms are found to be five times more common than sudden onset. The average duration of symptoms before a patient attend the hospital is 4.37 months.

6. Pain in the shoulder region extending upto arm and forearm in $\frac{1}{3}$ rd cases is the first presenting symptom in majority of cases. These cases without history of trauma are six times more common. The cases in which history of trauma was elicited, presented as of minor type.
7. Tenderness is present in all the cases but along the biceps tendon it is three times more common. In cases coming late, the wasting of muscles around the shoulder, especially deltoid and supra and infra-spinatus, are added.
8. Restriction of movements in all the planes are present in more than 70% of cases. Limitation of abduction is a common feature in all the cases. External rotation is more limited than internal rotation. Range of flexion is comparatively much more free. Pain is present at the limitation of movements in all patients.
9. Intra-articular hydrocortisone along with Physiotherapy and analgesics can be claimed as the best line of treatment as it is safe, more effective with relatively none or very rare complication. Moreover, no hospitalisation is required for the treatment. Physiotherapy, too, forms the integral part of treatment.

BIBLIOGRAPHY

BIBLIOGRAPHY

1. Baer, W.S. (1907) : Treatment of subdeltoid bursitis.
Bull. Johns Hopkin Hosp., 18 : 282-284.
2. Bailey, H. (1980) : Hamilton Bailey's Demonstration
of physical signs in clinical surgery. 16th edition,
edited by Alleon Clain.
3. Bosworth, B.M. (1941) : Calcium deposits in subacromial
bursitis. J.A.M.A., Vol. 116, No. 22 : 2477-82.
4. Brown, J.T. (1962) : Frozen shoulder. J.B.J.S.(Br.),
44-B : 963.
5. Buck, J.E. (1953) : J.B.J.S., 35-B : 491.
6. Bulgen, D.Y. et al (1984) : Frozen shoulder :
Prospective clinical study with an evaluation of
three treatment regimes. Annals of Rheu. Dis.,
43 : 353-60.
7. Codman, E.A. (1930) : Shoulder : Rupture of
supraspinatus tendon. Surg. Gynec. and Obstet.,
52 : 579-586.
8. Codman, E.A. : The shoulder : Privately published,
Boston, 1934.

9. Coventry, M.B. (1953) : Problem of painful shoulder.
J.A.M.A., Vol. 151, No. 3 : 177-85.
10. Crisp, E.J. and Kendall, P.H. (1955) : Treatment of periarthritis of the shoulder with hydrocortisone.
Br. Med. J., June 1955, 1500-1501.
11. Dacre, J.E., Beeney and Scott, D.L. (1989) : Injections and Physiotherapy for the painful stiff shoulder.
Annals of Rheu. Dis., 48 : 322-25.
12. Das, K. : Clinical methods in surgery, 12th edition.
Reprinted 1983.
13. De Palma, A.F. (1952) : Loss of scapulohumeral motion (Frozen shoulder) : Annals of Surg., 135, No. 2 : 193-203.
14. De Palma, A.F. (1967) : Long term study of shoulder joint afflicted with and treatment for calcific tendinitis. Clinical orthopaedics, 20 : 61.
15. Duplay, S. (1872) : Arch. Gen. Med., 20 : 513.
16. Farkas, A. (1953) : Frozen shoulder (Scapulobicipital syndrome). The Br. J. of Phys. Med., 16 : 187-191.
17. Farooq Ashai (1978) : Role of manipulation in the treatment of Frozen shoulder. I.J.O., Vol. 12, No. 2 : 176-79.

18. Giriela, G.S. and Grewal, K.S. (1964) : Frozen shoulder. Indian J. Anaesth., 12 : 323-326.
19. Haggart and Allen (1935) : Painful shoulder - Diagnosis and treatment with particular reference to subacromial bursitis. Surg. Clin. of N. Amer., Vol. 15, 1537.
20. Hitchcock, H.H. and Bechtol, C.O. (1948) : Painful shoulder, observation on role of tendon of long head of biceps brachii in its causation. J.B.J.S., 30-A : 263.
21. Hollandar, J.L., Brown, E.M. et al (1951) : Hydrocortisone and cortisone injected into arthritic joints. J.A.M.A., Dec. 22, Vol. 147, No. 17 : 1629-35.
22. Hollander, et al (1953) : Intra-articular hydrocortisone in Arthritis and Allied conditions. J.B.J.S., Vol. 35-A, No. 4 : 483-90.
23. Howarth, B. (1945) : Surg. Gynae. and Obst., 80 : 337.
24. Johnson, J.T.H., Baltimore, Maryland (1959) : Frozen shoulder syndrome in patients with pulmonary tuberculosis. J.B.J.S., Vol. 41-A, No. 5 : 877-882.
25. Kernwein, G.A., Rosenberg, B. and Sneed, W.R. (1961) : Aids in the differential diagnosis of the painful shoulder syndrome. Clinical Orthopaedics, 20 : 11-20.

26. Klam, P. (1962) : Periarthritis Calcarea of the shoulder joint. *Acta Radiol. Suppl.* 215.
27. Kraus, H. (1941) : The use of surface anaesthesia in the treatment of painful shoulder. *J.A.M.A.*, Vol. 116, No. 23 : 2882-83.
28. Lee, M., Dip, T.P. et al (1973) : Periarthritis of shoulder : A controlled trial of Physiotherapy. *Physiotherapy*, Vol. 59, No. 10 : 312-15.
29. Lindblom, K. and Palmer, I. (1939) : *Acta Chirurgica Scand.*, 82 : 133.
30. Lippmann, R.K. (1943) : Frozen shoulder, Periarthritis, Bicipital Tenosynovitis. *Arch. of Surgery*, 47 : 283.
31. Lippmann, R.K. (1951) : The frozen shoulder. *Surg. Clin. of N. Amer.*, 31, No. 3 : 367-83.
32. Mahaffey, H.W. (1963) : The treatment of a painful shoulder. *Surg. Clin. N. Amer.*, 43 : 1299.
33. Moseley, H.F. (1951) : Rupture of rotator cuff. *Brit. J. Surg.*, 38 : 340.
34. Nelson (1959) : *J.A.M.A.*, 169 : 814.
35. Neviaser, J.S. (1962) : Arthrography of shoulder joint and study of findings in adhesive capsulitis of shoulder. *J.B.J.S.*, 44-A, 1321.

45. Singh, O.P. et al (1980) : Periarthritis shoulder - Treatment by manipulation and Physiotherapy. I.J.O., Vol. 14, No. 2, 201-3.
46. Soodan, V.M., Gupta, A. and Singh, I. (1991) : I.J.O., Vol. 25, No. 2 : 136-137.
47. Steinbroker, O. and Argyros, T.G. (1974) : Frozen shoulder : Treatment by local injections of Depot Corticosteroid. Arch. Phys. Med. Rehabil., Vol. 55, May, 209-12.
48. Steward, H.H. (1949) : The painful shoulder : significance of radiographic changes in upper end of humerus. J.B.J.S., 31-B (3) : 418-22.
49. Travell, J. et al (1942) : Pain and disability of the shoulder and arm : Treatment by intra-articular infiltration with procaine hydrochloride. J.A.M.A., Vol. 120, No. 6, 417-22.
50. Thakur, S.K. (1977) : Periarthritis of the shoulder. J.A.M.A., Vol. 68, No. 3 : 49-51.
51. Tyber, M.A. (1974) : Treatment of painful shoulder syndrome with amitryptyline and lithium carbonate. Can. Med. Assoc. J., 68 : 731-36.
52. Withers, R.J.H. (1949) : Painful shoulder. J.B.J.S., 31-B (3) : 414-17.
